

socioeconomic status is possible. Additionally, we did not measure factors such as psychological stress, lack of physical exercise, and environmental tobacco smoke (ETS), all suspected to be associated with shorter telomere length and potential confounders if they are associated with exposure to traffic particles in the NAS cohort (Cherkas et al. 2008). Schikowski et al. (2008) found that distance to major roads and ETS exposure were both associated with lower socioeconomic status in the Ruhr area of Germany, which suggests that confounding by ETS is an important concern for ambient BC studies in general. However, we assume that ETS exposure would be fairly low among the population of elderly, male never-smokers included in our analyses and that any such bias would be reduced by the adjustment for socioeconomic variables in our models. Moreover, among the overall NAS cohort under follow-up during the same study period (605 subjects), we found no association between active smoking and near-residence annual average BC concentration ($0.01 \mu\text{g}/\text{m}^3$ higher BC among active smokers; $p = 0.531$), which suggests that ETS, presumably having a similar geographic distribution as active smoking, is unlikely to be an important confounder (data not shown).

In addition to ETS, there are other important indoor sources of BC, such as cooking and candle burning (LaRosa et al. 2002), that we did not take into account in our ambient BC predictions. If we were investigating the biological effects of total BC exposure, this would result in substantial measurement error and would be an important limitation of our study. However, we used ambient BC as a surrogate for traffic-related particles, in which case exclusion of BC of indoor origin actually reduces measurement error. Nevertheless, BC from indoor sources presents a possible source of confounding if ambient BC and indoor-generated BC are correlated. An ongoing exposure assessment study including indoor BC and sulfate-based penetration ratios shows that the correlation between BC of outdoor origin and BC of indoor origin is low in NAS homes ($r = -0.13$; data not shown). Therefore, confounding of the association between ambient BC and telomere length by BC of indoor origin is unlikely to be an important source of bias in our study.

Our findings suggest that higher annual average exposure to traffic-related air pollution is associated with shorter leukocyte telomeres among the elderly. Telomere attrition is a measure of biological aging that explains some interindividual variation in risk of atherosclerosis and coronary artery disease and may play an important role in the chronic health effects of airborne particles, particularly those rich in BC, which are primarily related to automobile traffic.

CORRECTION

Steve Melly was omitted from the list of authors in the manuscript originally published online. His name has been added here.

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